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Reply

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Reply: On the use of odds ratios vs hazard ratios, meta-regression and heterogeneity in meta-analyses

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We thank the editor of JACC for the opportunity to respond to the letters by Shah et al, Ma et al and Zhao et al. which all make similar statements about three aspects of the methodology employed in our recent meta-analysis. As the points raised are sufficiently similar we will address them as if they were derived from the same letter.

First, the use of odds ratios instead of hazard ratios was raised in the letters to the editor. While we concede that hazard ratios are preferable, when they are reported, as they take account of time to events and not only number of patient events. However, if, as in this case, some studies do not report hazard ratios and 95% confidence intervals or standard errors, then one cannot pool mortality data using this outcome. However if of course studies report number of events as a proportion of total participants for each treatment arm, then one can calculate odds ratios or relative risk. Some of the authors of the letters took the trouble of calculating hazard ratios, but, depending on which letter one believes, 2 or 3 studies did not report hazard ratios, so this constituent data is inevitably unreliable across 2 or 3 of the 6 included studies.

Second, the absence of meta-regression analyses in our work was questioned. The Cochrane Collaboration handbook section 9.6.4. suggests a minimum of ten included studies is required to justify meta-regression¹, as we only included six studies we remain convinced that we made the correct decision not to conduct meta-regression analyses.

Third, the letters to the editor suggested heterogeneity in our analyses was moderate and a random effects model should have been employed. In fact one letter suggested that even if heterogeneity is low, a random effects model should be employed. While

we are familiar with the concept that meta-analyses by definition have an inherent element of randomness², we are also aware of the alternative view, shared by guidance from the Cochrane collaboration handbook¹, that a fixed effects model is adequate unless heterogeneity is high, an $I^2\% = 49\%$ is not considered high.

Taken together the three points raised above, have led to the authors of the three letters to conduct alternative analyses that suggest our findings should be tempered and it is premature to suggest there is truly a difference in outcomes in on versus off pump cardiac surgery. Perhaps we can agree that the methodological differences are unequivocal evidence that further trial work, of a homogenous nature, in this area is required.

1. Higgins JPT, GS. Cochrane Handbook for Systematic Reviews of Interventions. 2011. <http://www//Cochrane-handbook.org>. Accessed March 29th 2012.
2. Borenstein M, Hedges LV, Higgins JP, Rothstein HR. A basic introduction to fixed-effect and random-effects models for meta-analysis. *Res Synth Methods*. 2010;1(2):97-111.